
Asset Management Program Improvement Project (AMPIP)

Customer Briefings/Outreach
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Winter/Spring 2014

Agenda



- What is Asset Management
- Western Asset Management
- Work Products & Progress to Date
- Additional Information Slides
 - AM Basics
 - AMPIP
 - Project Goals and Requirements
 - Project Stages
 - Next Steps



What is Asset Management?



- “Coordinated activity of an organization to realize value from assets” (ISO 55000: 3.3.1)
- “Systematic and coordinated activities and practices through which an organization optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organizational strategic plan” (PAS 55-1; 3.2)

Risk = Probability of Failure X Consequence of this Failure

- Probability of failure (PoF):
 - Determined by asset historical performance and current condition
 - Best analytically determined, but consistent, subjective criteria is ok
 - Responsibility of maintenance community

AM Basics – Risk *cont'd*



- Consequences of Failure:
 - Must be quantified in some matter
 - Best analytically determined, but consistent, subjective criteria is ok
 - Responsibility of operations, marketing & others
- Criticality: quantitative description of risk tolerance – may include willingness to accept risk of event
- Risk Register: AM term for the location of asset risk-related information

Western Asset Management

- 2-yr AMPIP to get started
- 3 Asset Classes: Long lead time, Large \$
- AM is Dynamic
 - Add assets or asset classes
 - Retire or replace assets
 - Mitigate risky assets (add, repair, replace, design)
 - Learn & Continuous Improvement

Purpose of AMPIP



Aging Infrastructure & Capital Funding

- Build on a programs already in place (RCM, MDCC, budget formulation, Maximo)
- Improve allocation of capital funding to reduce asset-related risks
- Provide objectivity and credibility to asset management processes
- Help Western and customers make tough decisions and set priorities



AMPIP Benefits

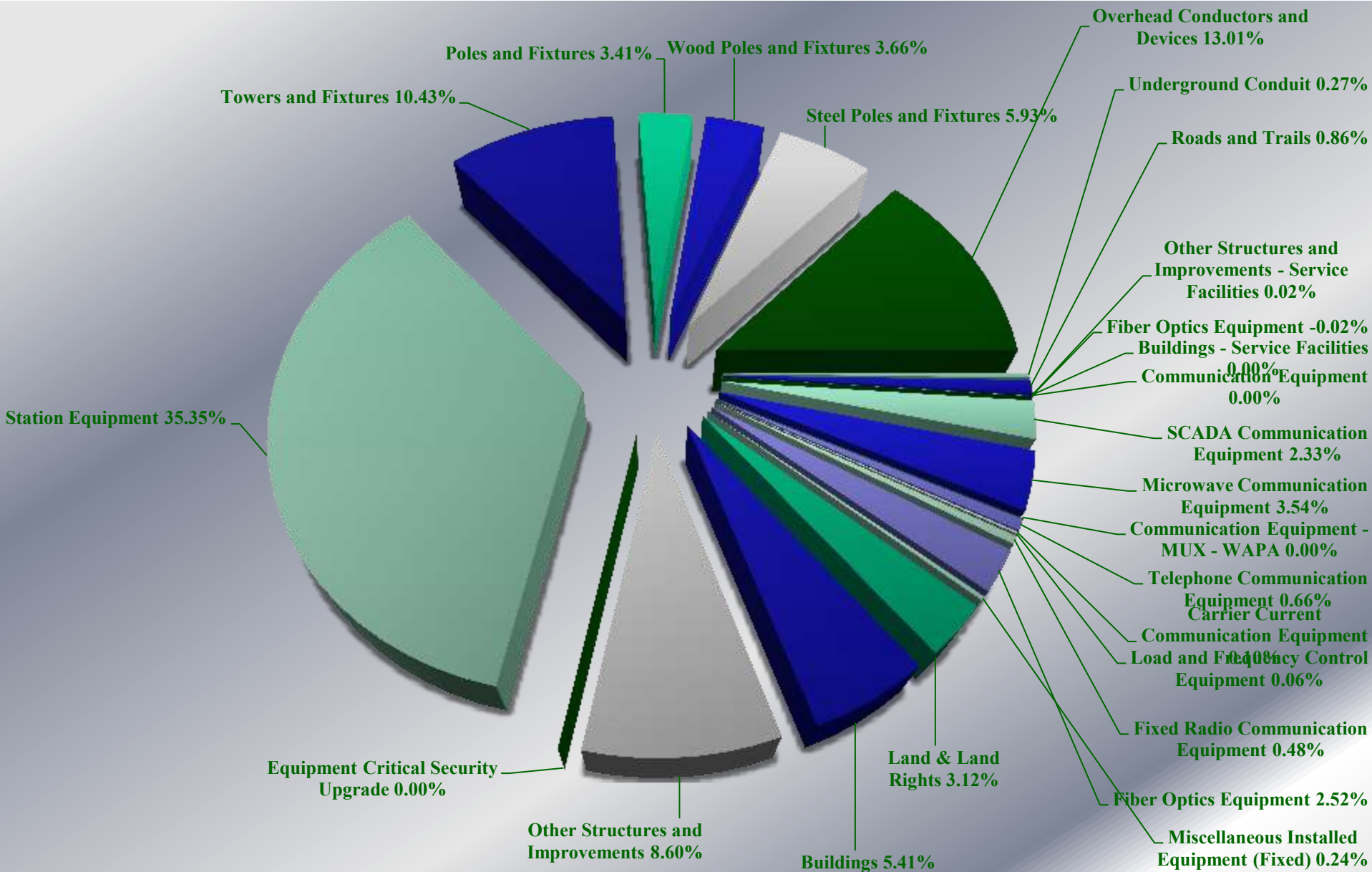


- Better justification of capital funding requests
- AM program based on industry standards
- Consistent and objective evaluation criteria
- Awareness of major asset risks
- Documentation of risks and mitigation
- Credible results to guide decisions
- Prioritization of projects and reservation of resources
- Improved reliability



Western Physical Assets

- Western Plant by FERC Task 35000 to 39800 (In Total) based upon Investment Costs -



AMPIP Stages/Schedule



- Stage 1: Initial Risk Assessment
(August 2012 – April 2013)
- Stage 2: Develop process details for program elements (December 2012 – August 2013)
- Stage 3: Populate risk registers (collect data)
(September 2013 – December 2013)
- **Stage 4:** Produce program results
(January 2014 – Spring 2014)
- Transition to Program (Summer – Winter 2014)



Work Products and Progress

Four Sub-Teams

- Equipment Condition Assessment (Power Transformers & Breakers)
- Transmission Line Condition Assessment
- Consequence of Failure Processes and Analysis
- IT (MAXIMO) Design and Development

Transformers



Parameters:

- All oil-filled power transformers, including units with LTC's, and oil-filled reactors
- All mobile transformers (separate asset class)
- All phase-shifting transformers (separate asset class)
- Includes units owned or maintained by Western
- Excludes pole mounted
- Excludes station service

Region/ MC	Quantity (517 total)
DSW	71
RM	111
UGP	211
SN	57
CRSP	67



Breakers



Parameters:

- Power circuit breakers, oil, air, vacuum, and SF-6
- 100-kV and above
- Excludes circuit switchers or other switchgear.
- Includes units owned (fully or partially) by Western
- Includes units maintained by Western

Region/MC	Quantity (1,446 total)
DSW	311
RM	253
UGP	546
SN	156
CRSP	180



Transmission Lines



Parameters:

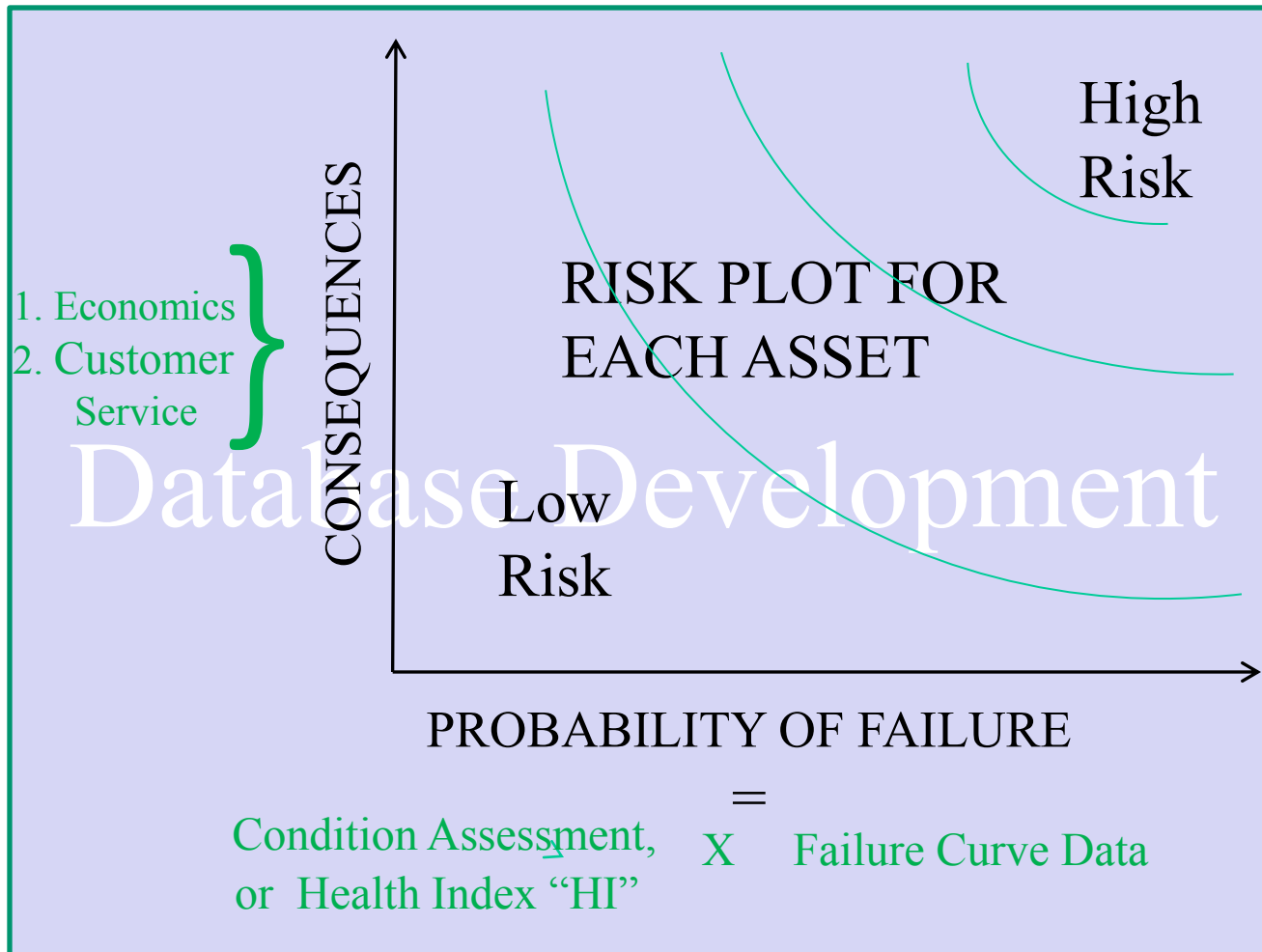
- 100-kV and above
- Breaker to breaker
- No underground
- Segments that Western owns or maintains

Region/MC	Quantity (600 total)
DSW	157
RM	126
UGP	199
SN	63
CRSP	55

Partial ownership (capacity only) does not qualify



Risk Development



1. Collect Data & Populate Database
2. Asset Analysis & Reports
3. Develop Asset Strategies & Plans
4. Develop/Update Projects
5. Update Project Ranking Criteria
6. Complete Manual & Bus. Rules (Maint. & Repeat.)

Consequences of Asset Failure

Two consolidated criteria & sub-factors:

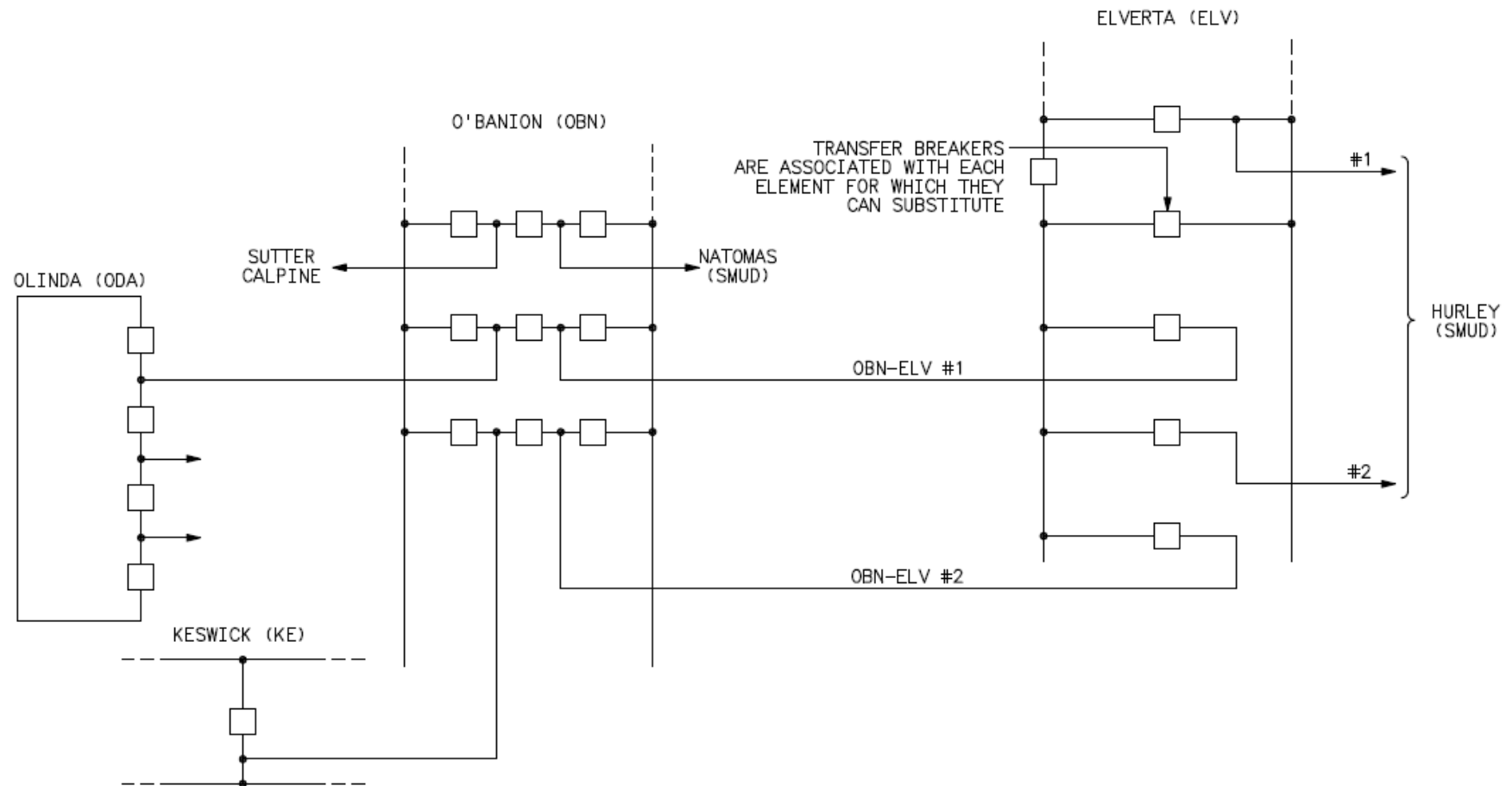
- Economic: 50% initial weight (more objective)
 - Costs (converted to “points”)
 - Power Marketing/Merchant Services Cost
 - TBU Tariff Cost
 - Marketing Adders
 - Critical Scheduling Hub or Market Path
 - Peaking / Load Following Unit
 - Curtails Merchant Ancillary Service Sales

Consequences of Asset Failure *cont'd*

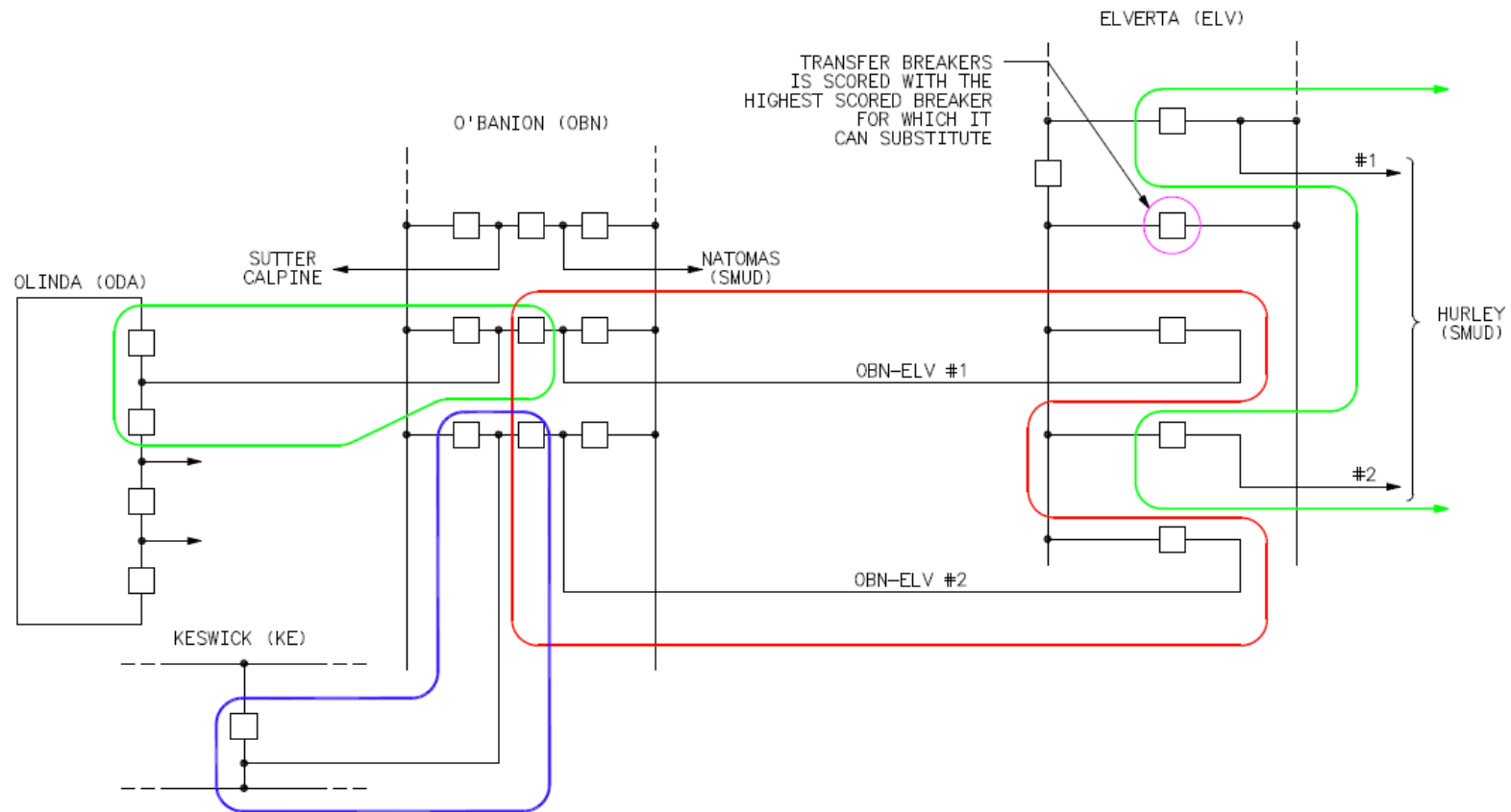


- Customer Service: 50% initial weight (more subjective)
 - Critical Service
 - OATT
 - Impacts to Others (regional impacts)
 - Redundancy (Redundant assets or parallel paths)

Consequence Assessment

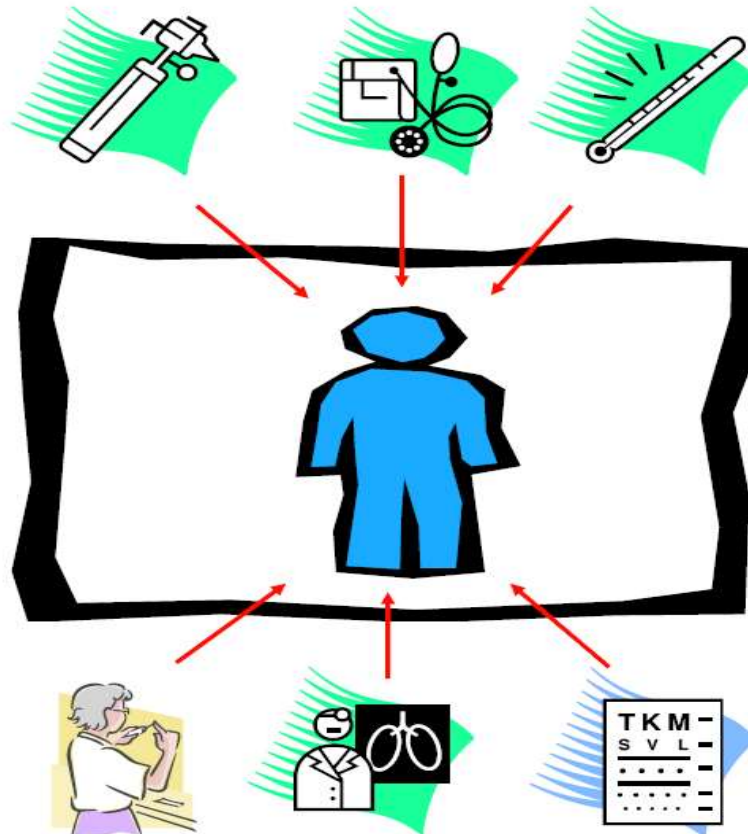


Consequence Assessments - sample



CONSEQUENCE
ASSESSMENT
GROUPING
EXAMPLES

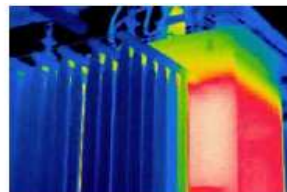
What is “Health Index” (HI)



“Health Index” (HI) for Equipment



Moisture-In-Oil Monitor



Infrared Scan



Visual Inspection



Power Factor Sensor



Visual Inspection

Health Index (HI) & POF Determinations

- Transformer Health Index (HI)
 - Oil Condition, Factor Weight = 4
 - Electrical Condition, Factor Weight = 4
 - O&M History, Factor Weight = 2
 - Age/Design/LTC, Factor Weight = 2
 - PoF based on historical records and applied Weibull curve

- Breaker HI
 - Maintenance History, Factor Weight = 2
 - Design/Obsolescence, Factor Weight = 2
 - Power System Stresses, Factor Weight = 2
 - Age, Factor Weight = 2
 - PoF based on historical records and applied Weibull curve

Health Index (HI) & POF Determinations

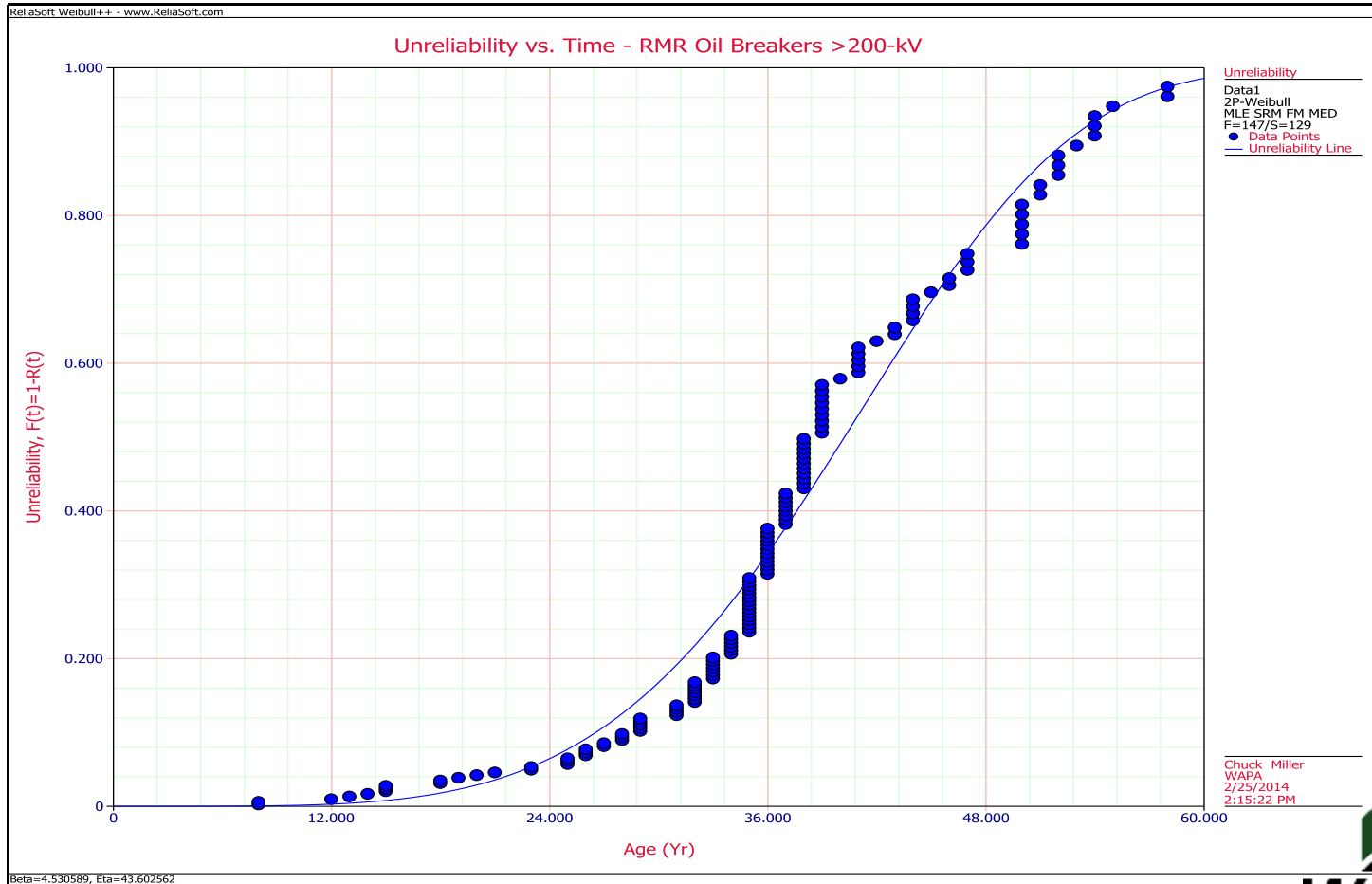
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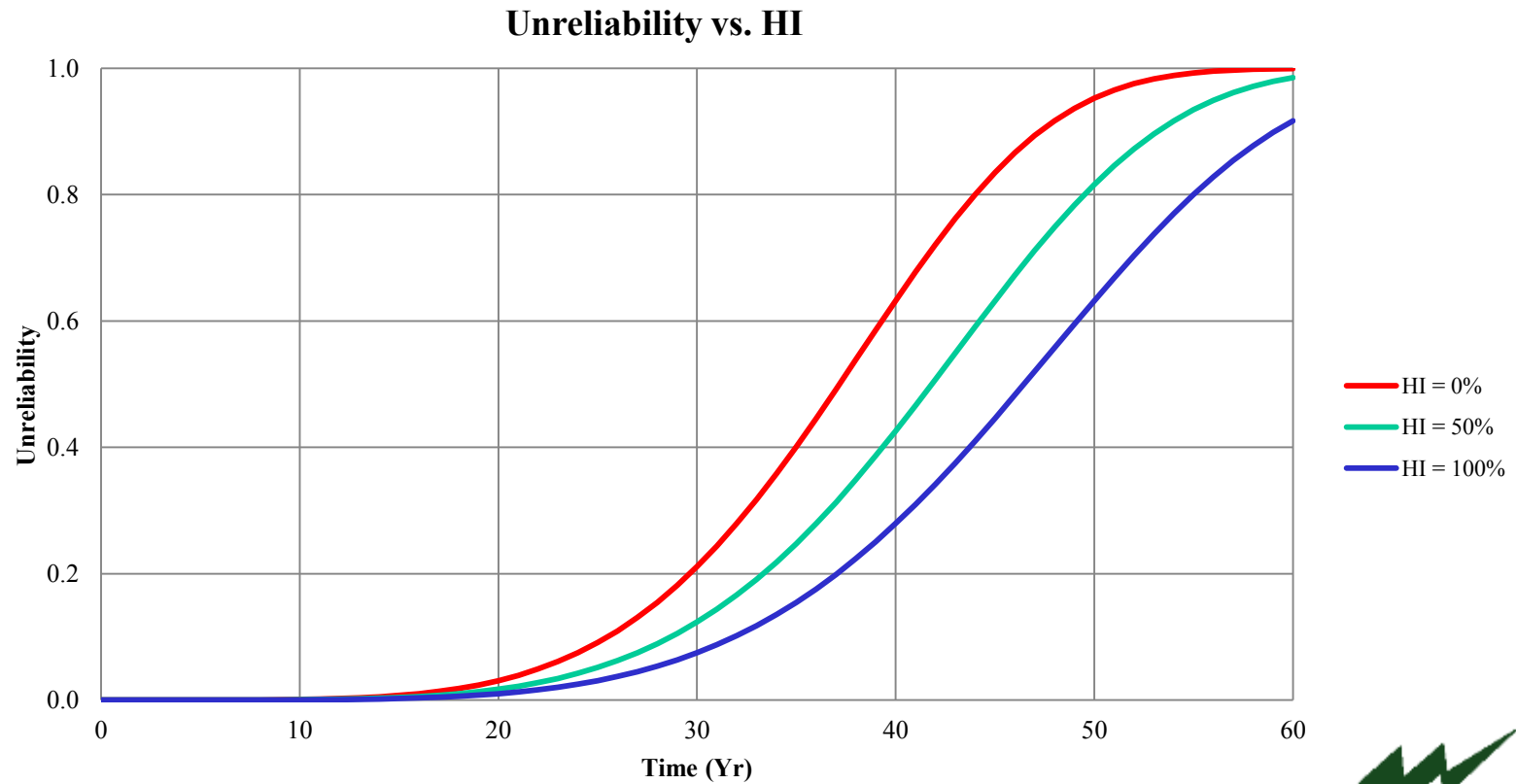
- Transmission Line Segment HI:
 - Structures
 - Age, FW=3
 - Conductors
 - Age, FW=1
 - Overhead Ground Wire
 - Age, FW=1
 - De-rating Factors (% de-rating varies by issue)
 - % Line Loading
 - ROW Encroachments Danger Trees/Vegetation #ea.
 - Outage History (based upon environmental/design/location/etc.)
 - % of features rated D or E (Low/poor failure coding)
 - Initial PoF based upon historical records



POF Determinations



POF & HI Comparison



Wrap Up

- Q/A
- Discussion

Additional Information Slides

Asset Management

AM Basics

- Mature, formalized practice in wide use
- Many industry AM groups
- Key reference: *PAS 55-1*
 - Addresses comprehensive AM program requirements
 - Focus on risk assessment



PAS-55



- *Publicly Available Specification 55-1:2008* is a product of the British Standards Institute.
- In 2011-12 AM Advance Team found that PAS-55 was widely accepted as a guide for establishing and maintaining asset management programs.
- The Advance Team document “Range of Alternative Characteristics” recommended that Western’s AM Program “Meets key/appropriate requirements of *PAS-55*”.



PAS-55 Requirements for Successful AM Program



Section 4: Requirements

4.1 General Requirements (establish, document, implement, maintain, improve)

4.2 AM Policy (derived from the **Organization's Strategic Plan**)

4.3 AM Strategies, Objectives & Plans

4.4 Enablers & Controls

4.5 Implementation

4.6 Assessment & Improvement

4.7 Management Review

Asset Management Program Improvement Project

Project History



AM Advance Team (June 2011- June 2012)

- Objectives
 - Facilitate development of AM program
 - Involve business functions (i.e. Maintenance, Power Operations, Power Marketing, etc.)
 - Evaluate other organizations' programs and tools
 - Identify key assets to be managed
 - Recommend a course of action for improvement
- Resulted in the current AMPIP Project



AM Program Requirements



- Part of Enterprise Risk Management
- Formal
- Compatible with industry standards
- Applicable Western-wide
- Objective criteria and measures
- Leverage existing tools & processes (MAXIMO, MDCC, budget formulation, RCM)
- Broad involvement within and external to Western
- On-going, dynamic, up-to-date data on assets



AMPIP Project Goals



Timely list of assets ranked by condition, risk, criticality, and priority for funding requests and leadership decisions

- Define program
- Develop and test new processes
- Apply new processes to the highest risk assets and events
- Determine sustainment needs
- Provide usable reports on infrastructure health



AMPIP Scope



Scope

- Improve existing processes and mature AM program
- Expand corporate knowledge of AM
- Communicate asset-related risks, and consequences of failure
- Establish an AM structure using *PAS-55*
- Initial focus on three Critical Transmission Assets:
Power Transformers, Power Circuit Breakers,
Transmission Line Segments (high \$ and long lead time)

Western Sponsorship



Senior Standing Team for Capital Assets (SST-CA)

- Regional Managers
- Chief Operating Officer
- Chief Information Officer
- Chief Financial Officer

Responsibilities:

- Approve: Critical Decision points, scope changes, funding requests
- Accept: Program Results



Progress



- CD's -2 & -3 Approved Aug 14, 2013
 - Identified Asset Category & Populations, and Consequence Categories & Criteria
 - Prioritized and selected asset classes for analysis
 - Determined initial weighting and scoring criteria and ratings
 - Formulated the HI
 - Tested samples and re-evaluated in each asset and consequence category
 - Vetted through Western leadership councils



Progress cont'd

- CD -2 & -3 Cont.
 - Developed Failure Curve data for asset classes
 - Obtained independent A-E review
 - Combined HI and Failure Curves to determine “Probability of Failure”
 - Determined IT solution for data storage and analytics
- Training & data collection for each asset (Aug – Nov 2013)
- Begin regional consequence analysis (Sep - Nov)
- Completed design & testing of new MAXIMO fields (Nov)
- Upload of Condition Assessment & Consequence Analysis Data into Maximo (Dec 2013 – Apr 2014)

Progress *cont'd*

- Scrub data for quality - Continuing
- Produce and review initial reports (Jan/Feb 2014)
- Regions validate initial reports (Feb-Mar)
- Validate HI and Risk scores with Regional experts (continuing)
- Adjust scoring weights as required
- Produce final 2014 Asset Risk reports (May 2014)
 - Identify and document high risk assets
- Apply results to capital budget processes FY16/17 & 10-yr Plan
- Review HI scoring methodology to simplify (future)
- Automate condition data acquisition where possible (DGA, Doble, bus fault duty) (future)

Additional AM Program Elements



- Risk register structure
 - Define document structure to record information
- Sustainability requirements
 - Organizational structure and staffing plan
- Program guidelines and business rules
 - AM Order
 - AM Manual
 - Framework for Asset Strategies & Plans

Stage 4 – Produce Program Results



- Rank Assets based on Risk
 - Produce reports
- AMPIP Assets Plans tied to next cycle of budgeting process and 10-Year Plans
- Implement changes for sustainability